

Material Handling Subpart N

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Subpart N - Materials Handling & Storage (1910.176 - 184)

Powered Industrial Trucks - Operator training

178(l)(1)(i) 316

Powered Industrial Trucks - Safe operating condition

178(p)(1) 184

Secure storage

176(b) 155

Powered Industrial Trucks - Operator certification

178(l)(6) 116

Powered Industrial Trucks - Examination

178(q)(7) 116

Standard:
1910.



General

- Everyday
 - Transport
 - Handle
 - Store
- Means
 - Manual
 - Power

Covers

- 1910.176 – Handling Materials, General
- 1910.177 – Servicing multi-piece & single piece rim wheels
- 1910.178 – Powered Industrial Trucks
- 1910.179 – Overhead and gantry cranes
- 1910.180 – Crawler locomotive and truck cranes
- 1910.181 – Derricks
- 1910.183 – Helicopters
- 1910.184 – Slings

Objectives

- Identify general requirements
- Identify servicing requirements for single-piece and multi-piece rim wheels
- Identify inspection design and operation requirements for:
 - Powered industrial trucks
 - Overhead and gantry cranes
 - Crawler, locomotive, and truck cranes
 - Derricks
 - Slings

Objectives (cont.)

- Identify communication, load handling, and protective requirements for helicopters

General Requirements

1910.176

- Mechanical equipment usage
- Aisles and passage ways
 - Permanently marked
 - No obstructions
- Secure storage
 - Shall not create a hazard
 - Tiers:
 - Stacked
 - Blocked
 - Interlocked
 - Limited in height

General Requirements 1910.176 (cont.)



General Requirements 1910.176 (cont.)

- Housekeeping
 - Kept free from materials creating hazards of the following:
 - Tripping
 - Fire
 - Explosion
 - Pests

General Requirements 1910.176(cont.)

- Clearance Limits
 - Warning signs
- Rolling rail cars
 - Bumper blocks
 - Where car could:
 - Contact another car
 - Enter a building, work, or traffic area

General Requirements

1910.176 (cont.)

- Guarding
 - Covers or guardrails to protect personnel from:
 - Open pits, tanks, vats, ditches, etc.

Multi-Piece and Single-Piece Rim Wheels 1910.177

- Hazards
- Employee Training
- Service Equipment
- Multi-Piece Rim Wheel – Safe Operating Procedure
- Single-Rim Wheel – Safe Operating Procedure
 - In 1984 OSHA Amended the Standard to Include Single-Piece Rim Wheels

Multi-Piece and Single Rim Wheels

1910.177 (cont.)

- Standard Includes:
 - Large Trucks
 - Buses
 - Trailers
 - Off-road Machines
- Does Not Include:
 - Automobile Tires
 - Light Truck Tires – Designated “LT”



Multi-Piece and Single Rim Wheels

1910.177 (cont.)

- Rim Wheel – A component assembly of wheel, tire, tube, and other components.
- Single- Piece Rim Wheel – A single-piece wheel is the component of the assembly used to hold the tire, form part of the air chamber (with tubeless tires), and provide the means of attachment of the assembly to the vehicle axle.

Multi-Piece and Single Rim Wheels

1910.177 (cont.)

- A multi-piece wheel is a vehicle wheel consisting of two or more parts, one of which is a side or locking ring that holds the tire and other components on the rim wheel by interlocking the components when the tire is inflated.

Multi-Piece and Single Rim Wheels

1910.177 (cont.)

- **Multi-Piece Rim** - In an accident, the wheel components separate and are released from the rim wheel with violent force. The severity of the hazard is related not only to the air pressure but also to the air volume.

Multi-Piece and Single Rim Wheels

1910.177 (cont.)

- **Single Piece Rim** - A release of pressurized air can also propel the rim wheel in any potential path that a rim wheel component may travel during an explosive separation, or the area into which the air blast may be released.

Multi-Piece and Single Rim Wheels

1910.177 (cont.)

- All employees working with these types of rims must be trained and evaluated!!!!

Multi-Piece and Single Rim Wheels

1910.177 (cont.)

- Training

- Contents (at a minimum):
 - OSHA Standard
 - Manufacturer's Rim Manual

Multi-Piece and Single Rim Wheels

1910.177 (cont.)

● Training (cont.)

- Demounting tires, including deflation
- Inspecting and identifying rim wheel components
- Installing, handling, and removing rim wheels
- Inflating tires when single-piece rim wheels are mounted on a vehicle
- Mounting tires, including inflating them with a restraining device or other safeguard
- Understanding the necessity of standing outside the trajectory during inflation of the tires and of inspecting the rim wheels following inflation.

Multi-Piece and Single Rim Wheels

1910.177 (cont.)

- Protection
 - Restraining Device
 - For Single or Multi-piece
 - Barrier
 - For Single Piece Only



Multi-Piece and Single Rim Wheels

1910.177 (cont.)

- A barrier can be a fence, wall, or other structure placed between a single-piece rim wheel and an employee during tire inflation to contain the rim wheel components in the event of the sudden release of contained air. Each barrier or restraining device must be able to withstand the maximum force of an explosive rim wheel separation or release of the pressurized air occurring at 150 percent of the maximum tire specification pressure for the rim wheel being serviced.

Multi-Piece and Single Rim Wheels

1910.177 (cont.)

- The restraining device can be a cage, rack, or an assemblage of bars and other parts that will constrain all rim wheel components during an explosive separation of the multi-piece rim wheel or during the sudden release of the contained air of a single-piece rim wheel.

Multi-Piece and Single Rim Wheels

1910.177 (cont.)

- Restraining Devices (cont.)
 - Removed From Service If:
 - Cracks at Welds
 - Cracked or Broken Components
 - Bent or Sprung Components Resulting from Misuse or Explosion
 - Pitted Component from Corrosion
 - Other Component Failure or Damage

Multi-Piece and Single Rim Wheels

1910.177 (cont.)

- Rim and Wheel Components
 - Inspected for Damage, Corrosion, Dirt, Oil, etc. – Before Mounting
- Size and Type of Tire and Wheel
 - Checked Prior to Assembly
 - Mismatching Avoided

Multi-Piece and Single Rim Wheels

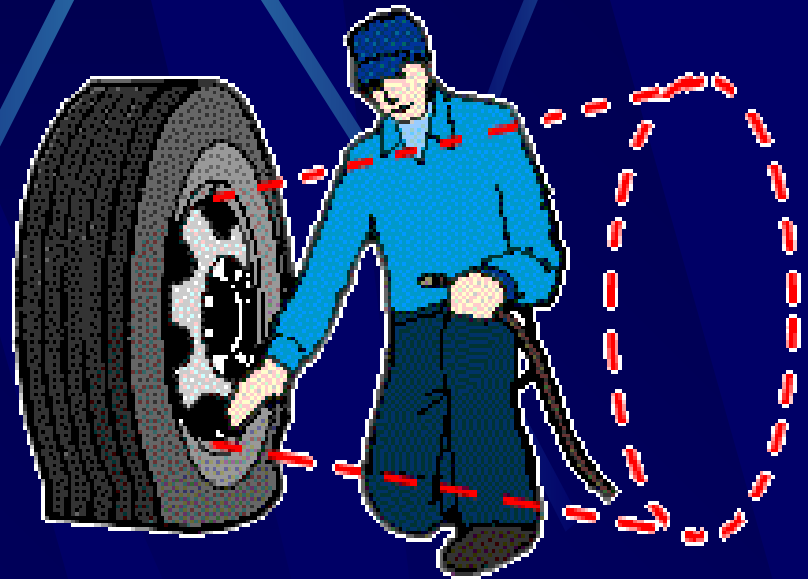
1910.177 (cont.)

- Multi-Piece Rim Components
 - Not Interchanged
 - Unless Allowed by Applicable Charts or Rim Manuals

Multi-Piece and Single Rim Wheels

1910.177 (cont.)

- Additional ER
Supplied Equip.:
 - Rim Manuals Provided
 - Only Tools
Recommended in Rim
Manual May be Used
 - Clip on Chuck and
Sufficient Length of
Hose
 - To allow EE to Stand
Outside the
Trajectory



Multi-Piece and Single Rim Wheels

1910.177 (cont.)

- Follow Safe Operating Procedures!!!!

Powered Industrial Trucks 1910.178

- Scope

- The scope provisions of 1910.178(a), which are based on ANSI B56.1 - 1969, remain in effect and cover:
 - ... fork trucks, tractors, platform lift trucks, motorized hand trucks, and other specialized industrial trucks powered by electric motors or internal combustion engines.
 - It does not apply to compressed air or nonflammable compressed gas-operated industrial trucks, farm vehicles, nor vehicles intended primarily for earth moving or over-the-road hauling.

Powered Industrial Trucks 1910.178 (cont.)

- This scope covers general industry, construction and shipyards.

Definitions

- A mobile, power-propelled truck used to carry, push, pull, lift, stack or tier materials. [American Society of Mechanical Engineers (ASME) definition]
- Commonly known as forklifts, pallet trucks, rider trucks, forktrucks, or lifttrucks.

Statistics

- Powered industrial truck accidents cause approximately 100 fatalities and 36,340 serious injuries in general industry and construction annually.
- It is estimated that 20 - 25% of the accidents are, at least in part, caused by inadequate training.

Bay
Lines, inc.
A TRUCKING SERVICE



**THIS ACCIDENT
SHOULD HAVE
BEEN PREVENTED**



General Req.

- Modifications
 - Manufacturer's written approval
- Operating Atmosphere
 - Hazardous or Non-hazardous
 - Determined before use
 - Table N-1 1910.178(c)(2)

General Req. (cont.)

● 11 Designation of trucks

- Based on protection and power supply
 - D
 - DS
 - DY
 - E
 - ES
 - EE
 - EX
 - G
 - GS
 - LP
 - LPS

General Req. (cont.)

- Training
 - No operation unless properly trained and Authorized
 - INCLUDING SUPERVISORS!!!
 - New standard
- “Approved Trucks”
 - Bear label from testing laboratory

Operator Training

● Safe operations

- The employer shall ensure that each powered industrial truck operator is competent to operate a powered industrial truck safely, as demonstrated by successful completion of the training and evaluation specified in the OSHA standard.
- Prior to permitting an employee to operate a powered industrial truck (except for training purposes), the employer shall ensure that each operator has successfully completed the required training (or previously received appropriate training).

Training Program Implementation

- Trainees may operate a powered industrial truck only:
 - Under direct supervision of a person who has the knowledge, training, and experience to train operators and evaluate their competence; and,
 - Where such operation does not endanger the trainee or other employees.



Sit Down Rider - Electric

Training Program Implementation (continued)

- Training shall consist of a combination of:
 - ◆ Formal instruction (e.g., lecture, discussion, interactive computer learning, written material),
 - ◆ Practical training (demonstrations and exercises performed by the trainee), and
 - ◆ Evaluation of the operator's performance in the workplace

Training Program Implementation (continued)

- Training and evaluation shall be conducted by a person with the knowledge, training and experience to train powered industrial truck operators and evaluate their competence.



Training Program Content

- Operators shall receive initial training in the following topics, except in topics which the employer can demonstrate are not applicable to safe operation in the employer's workplace.
 - Truck-related topics
 - Workplace-related topics
 - The requirements of the standard

Training Program Content (continued)

■ Truck-related topics

- Operating instructions, warnings and precautions
- Differences from automobile
- Controls and instrumentation
- Engine or motor operation
- Steering and maneuvering
- Visibility
- Fork and attachment adaptation, operation, use
- Vehicle capacity and stability
- Vehicle inspection and maintenance that the operator will be required to perform
- Refueling/Charging/Recharging batteries
- Operating limitations
- Other instructions, etc.

Training Program Content

(continued)

■ Workplace-related topics

- Surface conditions
- Composition and stability of loads
- Load manipulation, stacking, unstacking
- Pedestrian traffic
- Narrow aisles and restricted areas
- Operating in hazardous (classified) locations
- Operating on ramps and sloped surfaces
- Potentially hazardous environmental conditions
- Operating in closed environments or other areas where poor ventilation or maintenance could cause carbon monoxide or diesel exhaust buildup

Training Program Content (continued)

- The requirements of the OSHA standard on powered industrial trucks must also be included in the initial operator training program.

Refresher Training and Evaluation

- An evaluation of each powered industrial truck operator's performance must be conducted:
 - After initial training,
 - After refresher training, and
 - At least once every three years

Refresher Training and Evaluation (cont.)

Refresher training required when:

- Unsafe operation
- Accident or near-miss
- Evaluation indicates need
- Different type of equipment introduced
- Workplace condition changes

Avoidance of Duplicative Training

- If an operator has previously received training in a topic specified in this section, and the training is appropriate to the truck and working conditions encountered, additional training in that topic is not required if the operator has been evaluated and found competent to operate the truck safely.

Safety Guards



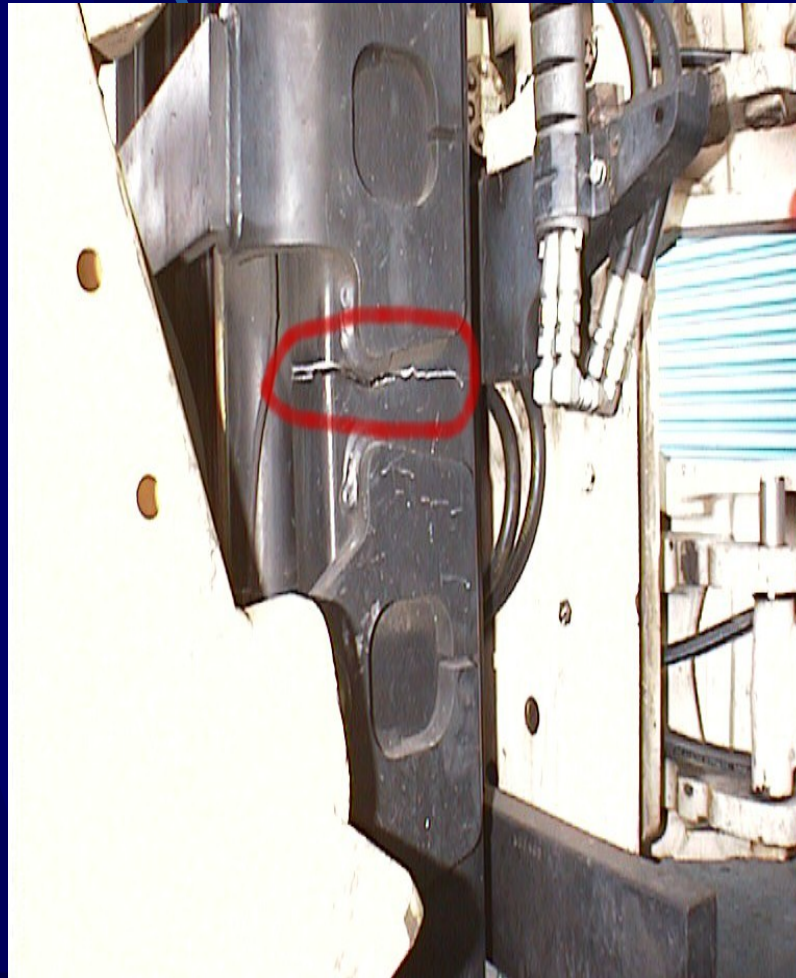
**Sit Down Rider Fork
- LPG**

- Overhead guards
 - On high lift trucks
 - Exception:
 - If operations or environment don't permit space for them.
- Back rest
 - If load presents a hazard of falling back on operator.

Pre-Operational Inspection

- All Fluid Levels
- Tires
- Hoses/Belts/Cables
- Mast/Forks
- Fuel/Battery Level
- Safety Equipment
- Gauges/Controls
- Horns/Alarms
- Steering
- Brakes
- Leaks

Hazard???



Loading and Unloading



- Trucks and Railcars
 - Wheel chocks
 - Set parking brake
 - Rail stops

Unattended Trucks

- Unattended:
 - Operator is More Than 25ft. From Truck
 - Truck Is No Longer In Operator's View
- Load Engaging Means Fully Lowered
- Controls Neutralized
- Power Shut Off
- Brakes Set
- Wheels Chocked if On an Incline

2 INCH HF COM
JACK HERE ↘



Gasoline or Diesel

- Never fuel the forklift near an open flame or heat source
 - **NO SMOKING ALLOWED**
- Turn the unit off before refueling
- Make sure the operator knows which type of fuel to add

Battery Powered

- Battery changing installations
 - Designated areas
- Areas must be provided with:
 - Apparatus to neutralize spilled electrolyte
 - Fire Protection
 - Protection for charging apparatus (from damage)
 - Hoist (or equivalent) for handling batteries

Overhead and Gantry Cranes 1910.179

Overhead and Gantry Cranes

General Requirements	Guards
Cabs	Hoisting Equipment
Footwalks and Ladders	Brakes
Stops	Electrical Equipment
Bridge and Trolley Bumpers	Inspection
Rail Sweeps	Handling the Load

Overhead and Gantry Cranes 1910.179



Overhead and Gantry Cranes 1910.179



Overhead and Gantry Cranes 1910.179



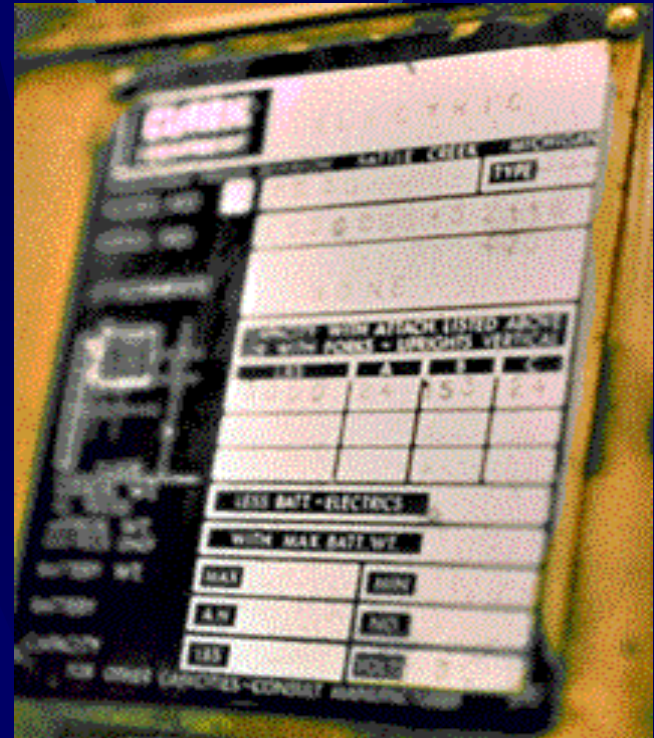
Overhead and Gantry Cranes 1910.179



Overhead and Gantry Cranes 1910.179

- General

- Rated Load Marked
- If More Than One Hoisting Unit:
 - Both Marked on it or it's Load Block
- Qualified Operators
- Preventative Maintenance Program



Overhead and Gantry Cranes 1910.179

- Cabs

- Operating Handles Within Reach of the Operator
- Shall Allow Full View of the Load Hook
- Access to Cab Checked Thoroughly

Overhead and Gantry Cranes

1910.179

- Cabs (cont.)
 - Bridge Footwalks (if provided)
 - 50 psf
 - Guardrails
 - Access by Fixed Ladder
 - Platform (if provided)
 - Step Across Distance Not to Exceed 12"



Overhead and Gantry Cranes 1910.179

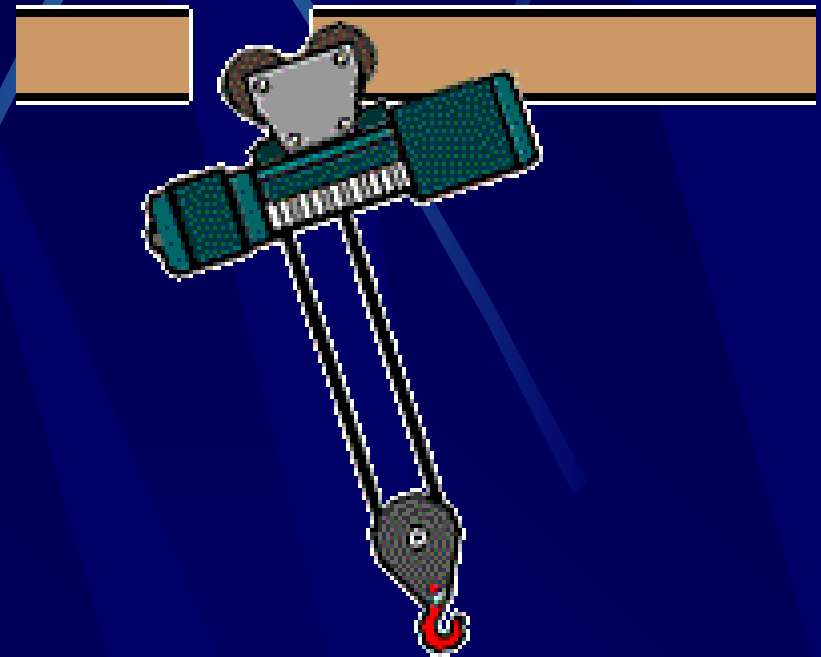
- Stops
 - Limits a trolley's travel
 - Provided on top running hoists
 - Inspected by the Bridge Footwalk

Overhead and Gantry Cranes

1910.179

● Stop Hazards

- Running off the trolley runway
- Falling to the floor
- Losing parts which fall and hit employees below
- Dropping or unexpectedly moving the load
- Contacting runway conductors and causing the entire crane to become energized.

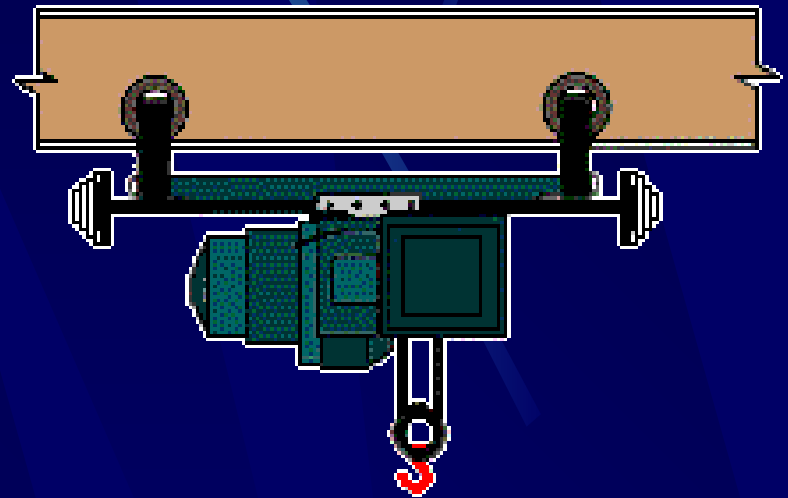


Overhead and Gantry Cranes

1910.179

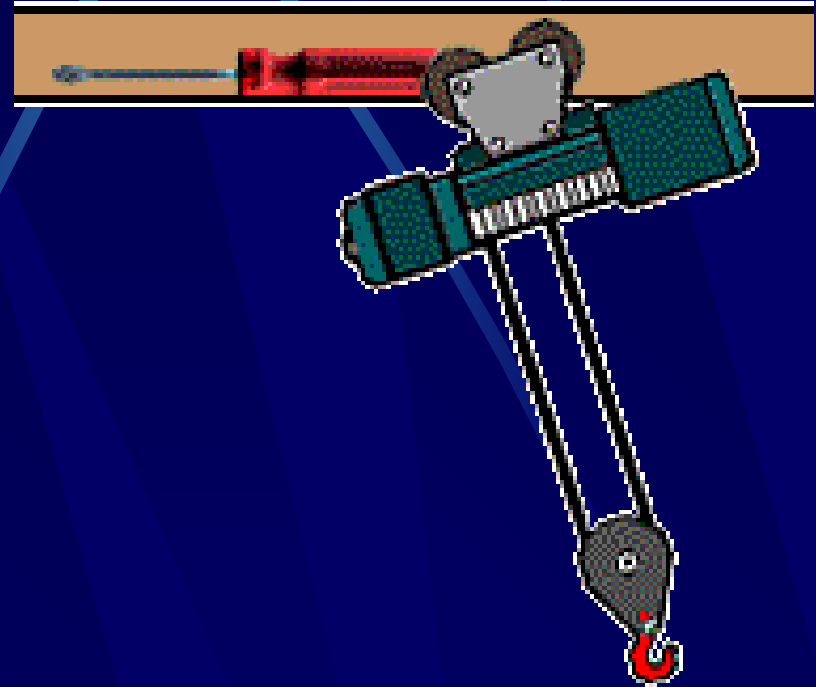
- Bridge and Trolley Bumpers

- Reduces Impact When
 - Crane Reaches the End of Travel Distance
 - Two or more Cranes Contact



Overhead and Gantry Cranes 1910.179

- Rail Sweeps
 - Protect From Derailment
 - Tools Left on Rail
 - Protect From Injury



Overhead and Gantry Cranes 1910.179

- Guards
 - Bridge Conductors and Hoisting Ropes
 - Moving Parts Near the Footwalk
 - Shaft ends, Chain and Sprockets, Gears, etc.

Overhead and Gantry Cranes

1910.179

- Hoisting Equipment
 - Sheaves
 - Clear and Free
 - Sheaves in Bottom Blocks
 - Close Fitting Guards to Prevent Fouling of Ropes
 - Hook – In Extreme Low Position
 - No Less Than 2 Wraps on the Drum



Overhead and Gantry Cranes 1910.179

- Brakes

- Holding Brake
 - On All Cranes

- Coasting Brake

- On all Floor Operated or Remote Operated Cranes

- Trolley Brake

- If Cab Operated

Overhead and Gantry Cranes 1910.179

- Electrical
 - Comply with Subpart S
 - Strain Relief
 - Pendant Controls Marked
 - Limit Switch

1910.179



Inspections

- Prior to Use/Alteration/Repair
- Daily to Monthly
- Monthly to Yearly

Monthly Inspection Certificate

[illegible]

Date:
Serial Number:
Inspector's Signature:

Crawler, Locomotive, and Truck Cranes 1910.180

- Must also meet ANSI B30.5-1968
- Have Qualified Operators

Crawler, Locomotive, and Truck Cranes 1910.180

Load Ratings

- Chart Must be Located and Observable to Operator

Load Rating Chart

The standard of living in third world countries is much lower than that of countries which are first world. If I were a rich man, or woman, I would not work at all. I would stay home and read. I would take art classes and travel around the world. My nice place has completely spread out in the past since I moved it. I would certainly take many useless classes.

[illegible]

Crawler, Locomotive, and Truck Cranes 1910.180

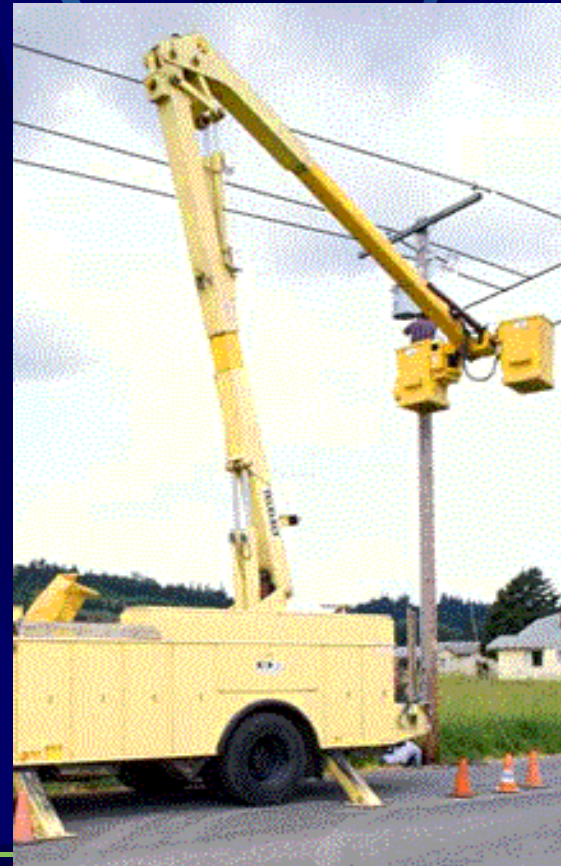
- Inspections
 - New/Altered/Repaired
 - Frequent
 - Regular

Crawler, Locomotive, and Truck Cranes 1910.180

- Handling the Load
 - Don't Exceed Rated Capacity
 - Below the Hook Lifting Devices
 - Don't Wrap Hoist Rope Around Object to be Lifted
 - Outriggers
 - Operators
 - Don't Leave Controls While Load Suspended

Crawler, Locomotive, and Truck Cranes 1910.180

- Electric Lines
 - 1910.333
 - Clearances
 - 10ft. + 4 inches for every 10kv over 50kv
 - Twice the length of the line insulator
 - Never less than 10ft.



Derricks

1910.181

- Types
 - Guy
 - Chicago
 - Basket
 - A Frame
 - Stiffleg
- Must Meet ANSI B30.6-1969

Derricks 1910.181



Derricks

1910.181

- Load Rating
- Inspection
- Testing and Maintenance
- Handling the Load
- Operating Near Electric Lines

Helicopters

1910.183

- Sections
 - Communication
 - Handling the Load
 - Protective Measures
- Must Meet FAA Guidelines

Helicopters

1910.183

- Communication
 - Briefing Before Operations
 - Training on Signaling Systems
 - Hand Signaling Chart
 - Pilot/Ground Crew Communication
 - Ground Crew Distinguishable



Helicopters

1910.183

- Handling the Load
 - Tag Lines Long Enough Not to Get Pulled Into Rotors
 - Electric Cargo Hooks
 - Prevented from unintended operation
 - Emergency means of releasing the load
 - Release of static discharge
 - All loose material secure within 100ft.

Helicopters 1910.183

- Protective Measures

- PPE

- Eye Protection
- Hard Hats with Chin Straps

- No Approach Within 50ft.

- Except for qualified personnel



Slings

1910.184

● General Safety

- Damaged or Defective Slings Not Used
- Not Shorted by Knots, Bolts, etc.
- Not Overloaded – Rated Capacity
- Securely Attached
- Padded or Protected from Sharp Edges
- Hand and Fingers Not Placed Between Load and Sling
- Not Pulled from Under a Resting Load

Slings

1910.184

- Inspections
 - Inspected - Daily
 - By a Competent Person

Slings

1910.184

- Alloy Steel Chain Slings
 - Sling Identification
 - Size
 - Grade
 - Rated Capacity
 - Length
 - Make Shift Fasteners Prohibited

Slings

1910.184

- Alloy Steel Slings (cont.)
 - Inspections
 - At Least Once a Year
 - More Frequently Based on Type of Use
 - Document
 - Remove From Service
 - Performed by a Competent Person

Slings

1910.184

- Proof Testing
 - New, Repaired, Reconditioned
 - In Accordance with ASTM A391-65
- Rating
 - Tables N-184-1



Slings

1910.184

- Removal From Service
 - Link Worn In Excess of Table N-184-2
 - Cracked or Deformed Links
 - Hooks
 - Cracked
 - Throat Opened More Than 15 Percent of Normal
 - Twisted More Than 10 Degrees

Slings

1910.184

- Wire Rope
 - Not To Exceed Rated Capacity
 - In Accordance with Tables N-184-3 and N-184-14

Slings

1910.184

- Removal of Service
 - Ten Random Broken Wires in One Rope Lay
 - Five Broken Wires in One Strand
 - Wear or Scraping of $\frac{1}{3}$ Original Dia. Of Outside Wires
 - Kinking, Crushing, Bird Caging
 - Heat Damage
 - Damage to End Attachments

Slings

1910.184

- Removal From Service (cont.)
 - Hook Throat Opened More Than 15 Percent of Normal
 - Hook With More Than 10 Degree Twist From Normal
 - Corrosion

Slings

1910.184

- Metal Mesh Slings
 - Marked with Rating for:
 - Basket Hitch
 - Choker Hitch
 - Rated Capacity
 - In Accordance with Table N-184-15

Slings

1910.184

- Removal From Service
 - Broken Weld or Joint Along the Sling Edge
 - Reduction In Diameter by 25 Percent from Abrasion or 15 Percent by Corrosion
 - Distortion of Handles

Slings

1910.184

- Natural and Synthetic Rope
 - Comply with Tables:
 - N-184-16
 - N-184-19
 - N-184-4
 - N-184-5

Slings

1910.184

- Removal from Service
 - Abnormal Wear
 - Powder Fiber Between Strands
 - Broken or Cut Fibers
 - Variation of Size or Roundness of Fibers
 - Discoloration or Rotting
 - Distortion of Hardware in Slings
- Rope Slings Cannot Be Repaired

Slings

1910.184

- Synthetic Web Slings
 - Marked to Show Rating Based on Material and Hitch
 - Uniform in Thickness

Slings

1910.184

- Removal from Service
 - Acid or Caustic Burns
 - Melting or Charring of Sling Surface
 - Snags, Punctures, Tears, or Cuts
 - Broken or Worn Stitches
 - Distortion of Fittings